

ABSTRACT

Permeability is one of the most important factors in influencing the commercial viability of a hydrocarbon reservoir. So far, permeability cannot be measured directly in-situ in reservoir formations. This invention relates to the field of estimating in-situ permeability of the reservoir rock formations. The measurements can be made across two wells or in a single well. Due to the morphology of their pore interconnections and the pore fluids in the rock, permeable rocks are elastically nonlinear. In a permeable rock, which is elastically nonlinear, the interactions between two elastic waves can be used in a unique way to map its physical properties. In this invention, the interaction of an elastic wave generated within the permeable rock with an externally generated seismic signal is used to determine the bulk tortuosity and bulk permeability of a reservoir rock formation.

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